Federal Republic of Germany

German Institute for Trademarks and Patents

Publication

DE 197 25 984 A 1

Reference 197 25 984.7
Registration Date: 6/19/97
Publication Date: 12/24/98

C 08 L 33/04
C 08 L 33/12
C 08 K 7/00
C 08 J 5/18
C 08 K 3/20
C 08 J 7/16
A 47 K 3/00
B 05 D 7/02

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56 Quotations
DE 1 95 07 174 A1
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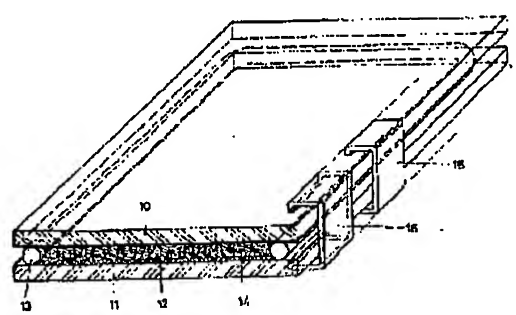
The following claims are withdrawn by applicant

Propositions for examination supported by paragraph 44 of PatG

54 Process and equipment acrylic surface production with high wear and stress resistance

57 The invention refers to an acrylic surface production with high wear and stress resistance. From a piece of mold (11), serving for producing an acrylic plate, firstly a layer of gel is added (12) in given concentration containing nanoscale particles, which are distributed in homogenous manner over the gel. Next, the still fluid pre-polymer is placed on the mold for producing the acrylic plate and then left to solidity, from mold that, after cure, an acrylic plate formed by the pre-polymer is obtained with a gel-coated layer.



Description

This invention refers to an acrylic surface production process with high wear and stress resistance. Such acrylic surfaces are applicable, for example, to sanitary articles such as bathtubs or shower and douche boxes.

From the state-of-technique, processes are known for polymer sanitary object production from a polymethil-meta-acrylate base. Such as for example DE 43 44 577 (A1) is characterized as said process. The polymethil-meta-acrylate (PMMA) also documented there in the form of inorganic particles such as filler, which are relatively thin, of which the particle size ranges from 20 to 60 μm. By these known processes, however, sanitary articles produced in molding, where all mold suspension containing said filler, which in ready PMMA plates are arranged by distributing over the entire mold volume. Filler application occurs in these known processes and additionally, they improve the thermal stability of the polymer sanitary installation.

Another process originating from the state-of the technique, which is characterized in DE—OS 43 13 715 (A1), describes the polymerization production in the same manner from the PMMA base under application of the filler inorganic particles with a preferably greater size than 10μm. In this process, the PMMA material in foam is then produced is less satisfactory to be used in sanitary article composition with surfaces having special resistance to attrition and scratches.

The purpose of this invention is a process, in other words, makes available an equipment for producing highly resistant acrylic surfaces to wear and stress, where acrylic plates are obtained capable of withstanding deep thrusts and, therefore, suitable for sanitary installation manufacture, such as for example, bathtubs and shower boxes, with the following deep thrust process.

The solution of this invention provides a process in the beginning called generic of indications characterized in the main claims, compatible with the invention. A characterization for execution and satisfactory equipment of this process is described in claim 13.

In the process according to the invention, first a so-called gel layer is produced with an existent methyl-meta-acrylate base thermal cure, which in a given concentration produces ceramic and inorganic particles in nanoscale (e.g. 20% of the volume) which are distributed in homogenous manner over the reaction core.

This gel layer is a high-viscosity mixture is mixed before processing with a harder substance, such as for example, benzoyl peroxide. In processes according to the invention, the gel coat is obtained before actual acrylic plate production, in the mold of, for example, a lower glass plate.

Different deposition possibilities are applicable for the gel coat. Preferably, deposition of sprinkling possibilities are employed through cylinders or bars. on the glass plate mold, and left to petrify (CURE WITH PARTIAL CROSSED LINKING) then filled with MMA (pre-polymer) in the mold where the polymerization process occurs and the material is hardened.

Acrylic plate production is done by pouring between two glass plates, which serve as mold and subsequently solidify. There from the gel coat is placed The liquid MMA to the acrylic plate (also to lined plates) preferably exists before the polymerization of a monomeric mix, pre-polymers, pigments and other additives. The strength of the resulting plate material is preferably employed in a circulation between both as low PVC thread glass plates with a desired width corresponding to the material strength.

Both forms serve as glass plates, preferably placed together as circular clamps and threads.

Before the lower plate thread stays with the upper glass plate they are joined by thread clamps, having to be a gel coat for the lining to be at least partially connected (so that it will be sufficiently viscous). The gel coat, in this case placed under the glass plate and then the upper glass plate is overlaid.

An alternative to these procedures, which is deduced from there, is that, firstly, the unlined acrylic plate is poured for the gel coat formation by sprinkling, or application through cylinders or bars. These alternatives are considered beforehand, so that this lining will be leveled and that sufficient cure will take place quickly. Preferably, polymerization should be conducted so that ready plates will be free of monomers.

The strength in the middle of the gel coat preferably produces linings in the lower than or equal to 0.4 mm range. The lining leads to high attrition resistance and a high surface scratching resistance.

The nanoscale particle concentration on the gel coat preferably remains between 2 and 30%, and additionally between 5 and 20%.

In principle, nanoscale crystalline particles can be exchanged for nanoscale particles; preferably, nanoscale crystalline particles are inorganic particles, such as for example oxides, such as TiO_2 , SiO_2, Al_2O_3, or other similar substances in consideration.

Nanoscale particle size is preferably mostly in the range between 10 and 100nm, additionally the size range of the majority of the number of particles being between 60 and 80 nm. The nanoscale particle size is also essentially smaller than inorganic fillers size, in this case, which in the beginning of said process will be inserted, according to the state-of-the technique.

The gel lining used according to the process object of the invention, can, for example, contain a thermal cure resin based on methyl-meta-acrylate with, preferably, up to 30% of nanoscale particles dispersed therein. Additionally, the gel lining may contain an acceleration agent, for example, a 0.1 to 5% quantity, preferably, in 0.5% and 1.5% quantity.

The gel lining contains, further, preferably, peroxide in a quantity of, for example, between 1 and 5%, preferably, in a quantity about 3%. As acceleration agent, for example, amines are used, preferably, dimethylamine. As peroxide, dibenzoyl peroxide can be used.
The gel coat activity strength on the glass plate preferably occurs with 0.2 to 2 mm strength, and additionally preferably the activity strength is somewhat around 0.4 to 1 mm. According to an invention alternative the gel activity strength also occurs in the acrylic plate deformation. In sad claims preferable characterizations are found to deepening orientation to the process according to the invention.

Additional advantages of the invention result from the following descriptions in details.
Next, this invention appears, based on an implementation example under reference of drawings described below. They show:
Fig 1 – equipment for producing an acrylic plate according to the invention while in the production process;
Fig 2 – a ready acrylic plate according to the production process.
As can be deduced from Fig. 1, an upper glass plate 10 is included in the equipment according to the invention, as well as a lower glass plate 11. Over the lower glass plate 11 a gel coat 12 is placed, which contains the nanoscale particles and further ahead builds an attrition resistant surface layer. The gel coat strength 12 is preferably quantified between 0.4 millimeters and 2 millimeters
The equipment further includes a circular dense thread 13 between the upper glass plate 10 and the lower glass plate 11, which prevents pre-polymer filling outflow 14. Both glass plates 10 and 11 then mount the mold for the acrylic plate production. The pre-polymer 14 can pour over the gel coat 12 over the lower glass plate inferior 11 and from there can overlay upper glass plate 10. Both glass plates 10 and 11 of the equipment are preferably joined by thread clamps 15 and 16, which are, for example regularly arranged in circles. The pre-polymer is now, through a filling wedge, directed between both glass plates and is joined to the gel goat already over the loser glass plates. An acrylic plate (preferably of PMMA) is then obtained from the polymer mix solidification, with an attrition and scratch resistant surface layer, which likewise has a defined layer strength and that is built through the gel coat solidification 12. Nanoscale particles are only found in this surface layer 12.
Fig 2 shows a ready acrylic plate 17, after the deformation. As is seen, it exists on a lower layer, which is indicated with 18 and over said layer 14 corresponds to the pre-polymer. The thin surface layer of the surface layer 19 of the acrylic plate 17 is originating from said gel coat 12. Both layers 18 and 19 of acrylic plate 17 are firmly and solidly connected one to the other, which subsequent acrylic plate 17 can be a concentration of nanoscale particles, which are distributed over the homogenous gel coat and that in the acrylic plate mold production sequence is filled with still liquid pre-polymer, by leaving it to solidify, and then, after pre-polymer solidification can produce one of the acrylic plate lining layers, which is originated from the gel coat.
sanitary installation of any mold, having for this apply a light traction in its production. Upper layer 19 does not show grooves or prints.

Claims

1. Acrylic surface production process with high attrition and scratch resistance, characterized by the fact of producing part of a mold (11, 12), which service for the acrylic plate production, in permanent conjunction firstly with a gel coat (12), containing give
2. Acrylic surface production process according to claim 1, characterized by the fact that the gel coat contains a thermo-cure resin and a methyl-meta-acrylate base.
3. Acrylic surface production process according to claims 1 or 2, characterized by the fact that the gel coat adquires hardness before processing.
4. Acrylic surface production process according to claims 1 to 3, characterized by the fact that the gel coat contains nanoscale particles in a concentration between 2 and 30%, preferably with a concentration between 5 and 20%.
5. Acrylic surface production process according to claims 1 to 4, characterized by the fact that the gel coat contains inorganic particles that are crystalline.
6. Acrylic surface production process according to claims 1 to 5, characterized by the fact that the gel coat contains nanoscale particles of an inorganic oxide, preferably TiO_2, SiO_2 or Al_2O_3.
7. Acrylic surface production process according to claims 1 to 6, characterized by the fact that the nanoscale particle size in the gel coat is between 10 and 100nm, preferably between 60 and 80 nm.
8. Acrylic surface production process according to claims 1 to 7, characterized by the fact that the gel coat is methyl-meta-acrylate base thermo-cure, containing up to 30% of nanoscale particles in dispersed form, an accelerator in a quantity from 0.1 up to 5%, preferably between 0.5 and 1.5% and a peroxide in a quantity between 1 up to 5%, preferably between 2 and 4%.
9. Acrylic surface production process according to claims 1 to 8, characterized by the fact that the gel coat will withstand strength between 0.2 and 2 mm, preferably between 0.4 and 1mm.
10. Acrylic surface production process according to claims 1 to 9, characterized by the fact that the gel coat, through deposition or cylinder or bar leap or similar to the forms, will be added to the acrylic plate production.
11. Acrylic surface production process according to claims 1 a 10, characterized by the fact that we have as a old for acrylic plate production, two glass plates (11, 12) and the gel coat (12) before filling of

12. Pre-polymer (14) of one of t he glass plates as lining.

13. Acrylic surface production process, according to claims 1 to 11, characterized by the fact that the gel coat will be placed on the lower side (11) of both glass plates.

14. Acrylic plate production equipment with one surface, according to claims 1 to 12, showing a high attrition and scratch resistance, characterized by the fact that the equipment includes an upper glass plate (10) and a lower glass plate (11) and that the acrylic plate production mold and from a distance defined between them will further occupy the dense thread circulation (13), between both glass plates (10, 11), which is seen in the front and both glass plates (10, 11) that are joined by clamps arranged in circles (15, 16).

15. Acrylic plate with high attrition and scratch resistance, characterized by the fact of being produced by a process with the characteristics of one of claims 1 to 12.

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Número: DE 197 25 984 A1
Classe Internacional 6: C 08 L 33/04
Data de Publicação: 24 de dezembro de 1998

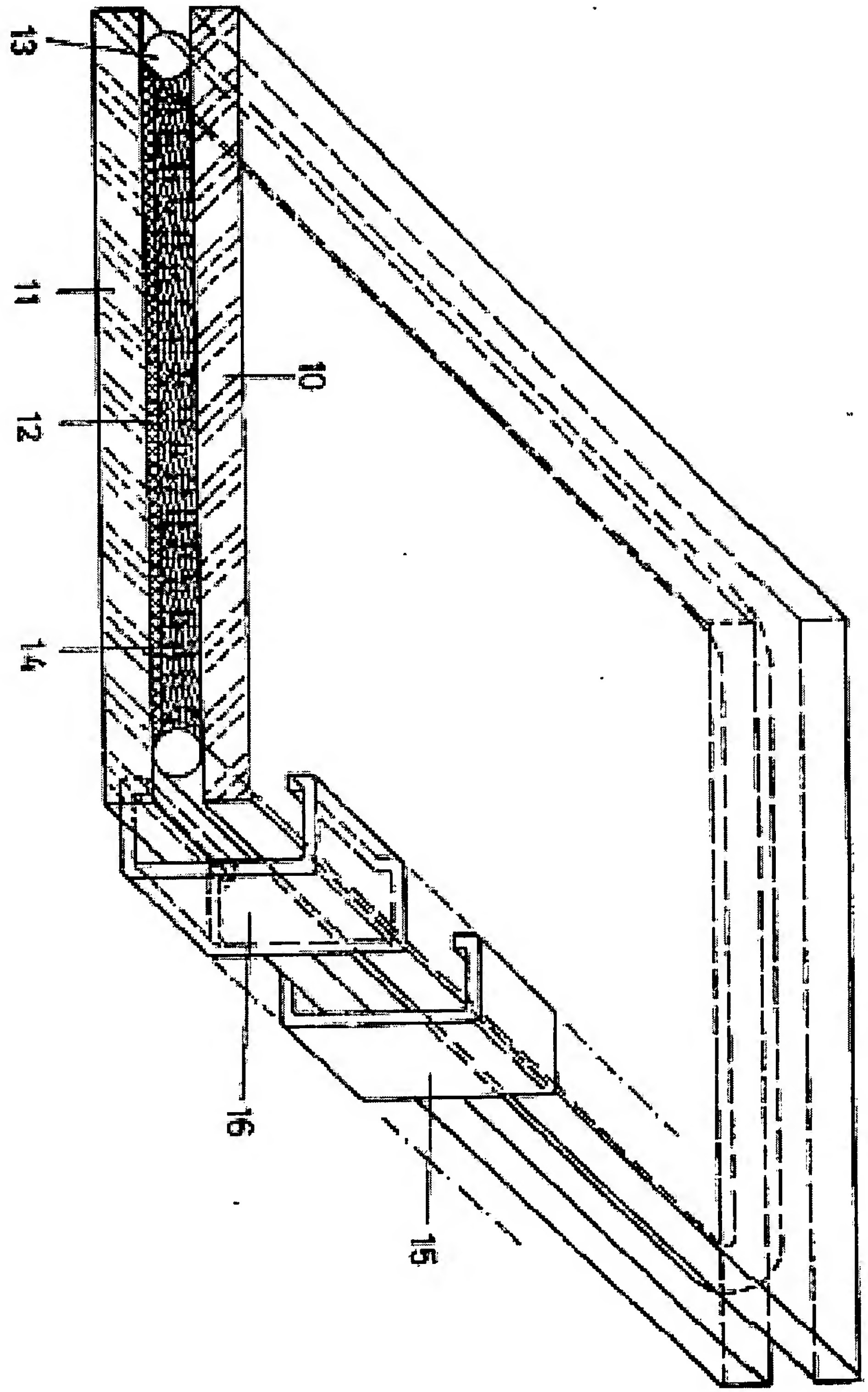

Fig. 1

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Fig. 2